Coastal Marine Demonstration of Forecast Information to Mariners for the U.S. East Coast

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LONG-TERM GOAL

Our long-term goal is to develop the capability to estimate and predict the coastal and estuarine environment and deliver these estimates to mariners, managers, and scientists. Relevant atmospheric variables include wind, temperature, humidity, precipitation, and visibility. Oceanic variables of interest include waves, currents, temperature, salinity, and water level.

OBJECTIVES

This collaboration will (1) demonstrate our current capability to estimate and predict the marine environment of Chesapeake Bay and the coastal ocean of the Mid-Atlantic Bight, (2) develop and apply new techniques for delivering marine information to users, and (3) continue to improve our ability to estimate the marine environment. Chesapeake Bay and the neighboring coastal ocean are heavily used for military, commercial, and recreational purposes. Marine environmental information is needed for safe and efficient operation in these waters. This is also a region for which there have been efforts to develop estimation and prediction capabilities. The Coastal Ocean Forecast System (COFS) (Aikman et al., 1996) has been applied to the East Coast of the United States for several years. The atmosphere over Chesapeake Bay is being modeled at fine resolution by the Regional Atmospheric Modeling System (RAMS) (Cotton et al., 1994). The Chesapeake Area Forecast Experiment (CAFE) (Bosley and Hess, 1997) has been developed and evaluated as well. Other tools are now available including the Local Analysis and Prediction System (LAPS) (Albers, 1996) and the mesoscale ETA model (Black, 1994). At the same time, regional real-time observational systems are expanding and providing the data necessary for mesoscale forecasts.

APPROACH

We are conducting two demonstration periods. The first was June 17, 1999 through July 31. During this period, estimates and forecasts were delivered to participating users. New methods for the delivery of these products were developed as a significant component of this collaboration. While new communications channels are attractive, most users will want information delivered through existing channels. We are exploiting the web for land based users and providing tools for accessing the products from shipboard. When necessary, products are faxed. The volume of information emanating from analysis and forecast systems is overwhelming. Delivered information must be customized and synthesized. Users are asked to assess the product during and after the demonstration period and in post-demonstration interviews.

Our analysis and forecast suite includes the COFS, LAPS, RAMS, CAFE, and meso-ETA. A significant component of this project is the connecting of data streams between these systems. The GLERL (Schwab, 1984) and SWAN (Holthuijsen et al., 1993) models are being applied to estimate the surface wave field. The output of these models and analyses was delivered to the users as described above.

WORK COMPLETED

Our primary objective for this year was the completion of the end-to-end system that incorporated the coupling of model systems as shown in Figure 1 and the delivery of data and model output to our user-partners. This objective was successfully completed and has stimulated substantive participation by our partners including the regional weather offices, the Marine Prediction Center, the Coast Guard and the Navy. The web interface is seen in Figure 2. Substantial improvements have been made to the models including: 1) the addition of satellite data assimilation to the COFS, 2) increasing the resolution and coverage of the COFS, and 3) forcing the Chesapeake Bay model with winds from the CBRAMS and CBLAPS systems. The new system is now called the Chesapeake Bay Estuarine Forecast System (CBEFS). In addition, we have conducted a survey of our users, and we are evaluating the accuracy of the model forecasts.

RESULTS

While the impact of model improvements is still being evaluated, user evaluations have been assessed. The ratings of four quality criteria were good or better for the following percentage of evaluations: accessibility – 87%, accuracy – 86%, display/format – 65%, and needs met – 62%. The models and delivery have been and continue to be improved based upon the input of our users and our assessment of model performance.

IMPACT/APPLICATION

Users found that these products have substantial utility. The real-time application and analysis of these models is leading to an acceleration of model improvements. We anticipate that these products will be requested for the entire coastal United States within the next few years. As models mature and are combined with biological models, there may be additional applications beyond the scope of this project. Specifically, there are opportunities for important contributions to water quality and fisheries/recruitment models.

TRANSITIONS

The transition process is ongoing. An important result of the Demonstration is that end users are developing an understanding of the utility of these products and learning to improve forecasts by applying the information contained in these predictions. This process is developing the knowledge base needed to effectively improve forecasts. Our final report will include suggestions for transition of the system to operational status.

RELATED PROJECTS

Each PI is conducting a research program that is supporting and benefiting from participation in this project.

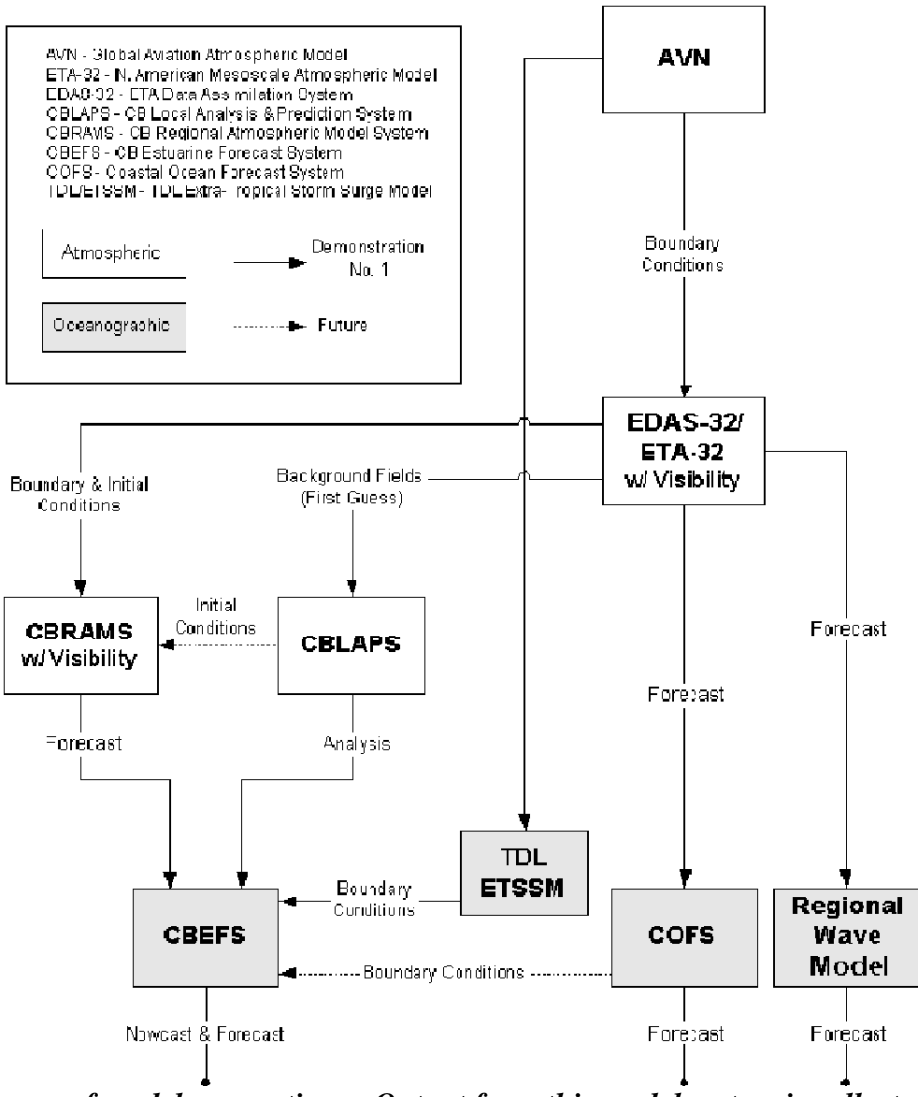

Figure 1 Summary of model connections. Output from this model system is collected by the display system and delivered to customers as shown in Figure 2. CBRAMS and CBLAPS are the Chesapeake Bay configurations of the RAMS and the LAPS respectively.

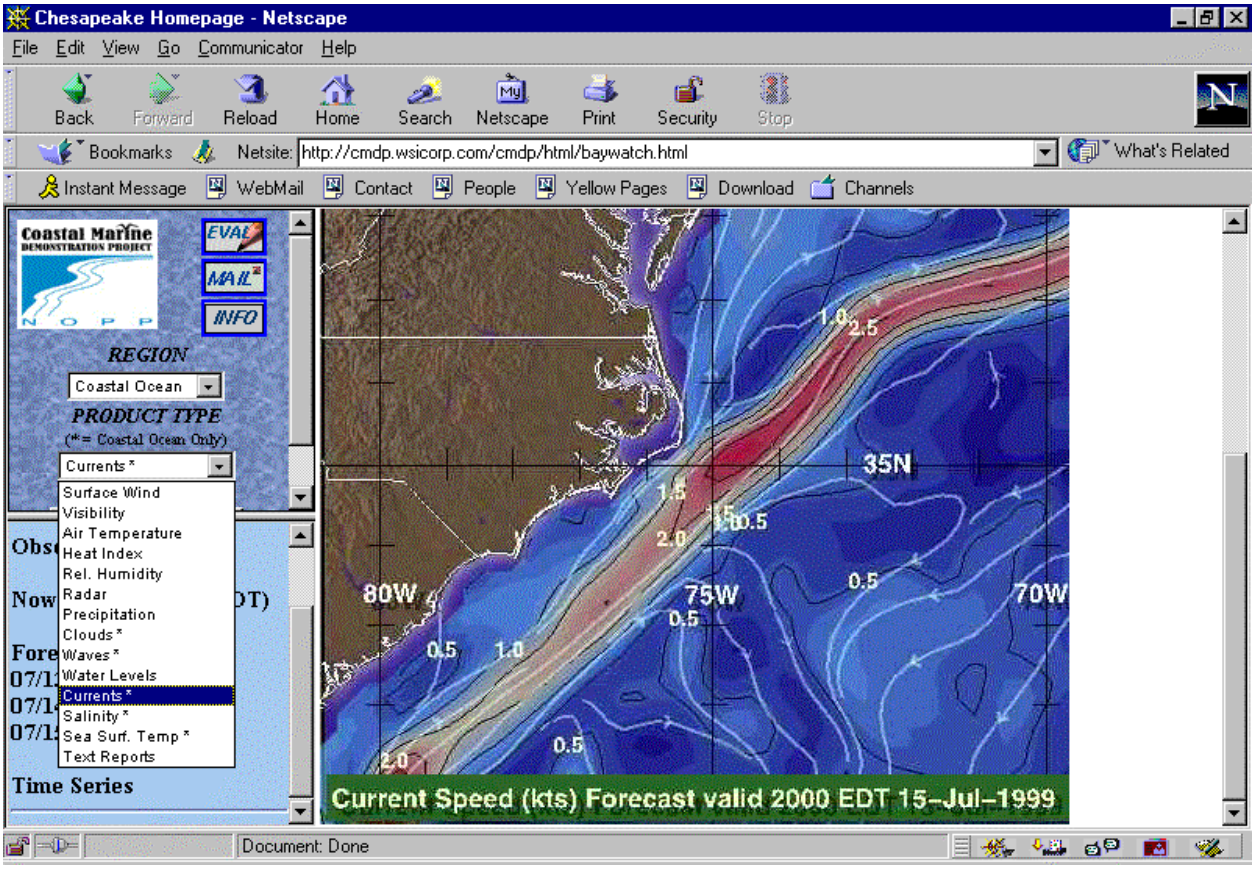

Figure 2. Coastal Marine Demonstration Project web based interface to CMDP products. Image shown is the surface current from the Coastal Ocean Forecast System near Cape Hatteras for July 15, 1999. Streak-lines indicate the direction of flow.

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